6   for each of said plurality of light sources, comparing at least a portion of said observer

7   data with at least a portion of said lighting data to determine if a modeled point within said scene

8   is illuminated by said light source and storing at least a portion of said light image data

9   associated with said point and said light source in a light accumulation buffer; and then

10   combining at least a portion of said light accumulation buffer with said observer data; and

11   [displaying] outputting resulting image data [to a computer screen].

Please add the following new Claims.

2.

1   49. (New)   The method as recited in Claim 1, wherein said observer data includes

2   observed color data and observed depth data associated with a plurality of modeled polygons

3   within said scene as rendered from an observer's perspective.

3.

1   50. (New)   The method as recited in Claim 49, wherein said plurality of modeled

2   polygons within said scene are associated with at least one pixel, such that said observed color

3   data includes an observed red-green-blue value for said pixel and said observed depth data

4   includes an observed z-buffer value for said pixel.

4.

1   51. (New)   The method as recited in Claim 49, wherein said lighting data includes

2   source color data associated with at least one of said light sources and source depth data

3   associated with said plurality of modeled polygons within said scene as rendered from a plurality

4   of different light source's perspectives.

1   *5.* ~~52.~~ (New)   The method as recited in Claim *4* ~~51~~, wherein said plurality of modeled

2   polygons within said scene are associated with at least one pixel, such that said source color data

3   includes a source red-green-blue value for said pixel and said source depth data includes a source

4   z-buffer value for said pixel.

1   *6.* ~~53.~~ (New)   The method as recited in Claim *4* ~~51~~, wherein the step of comparing at least

2   a portion of said observer data with at least a portion of said lighting data to determine if a

3   modeled point within said scene is illuminated by said light source further includes comparing at

4   least a portion of said observed depth data with at least a portion of said source depth data to

5   determine if said modeled point is illuminated by said light source.

1   *7.* ~~54.~~ (New)   The method as recited in Claim *6* ~~53~~, wherein the step of comparing at least

2   a portion of said observed depth data with at least a portion of said source depth data to

3   determine if said modeled point is illuminated by said light source further includes converting at

4   least a portion of said observed depth data from said observer's perspective to at least one of said

5   plurality of different light source's perspectives, before comparing said observed depth data with

6   said source depth data.

8.

1   ~~55.~~ (New)   The method as recited in Claim ~~54~~ **7.** wherein the step of converting at least

2   a portion of said observed depth data from said observer's perspective to at least one of said

3   plurality of different light source's perspectives further includes using a precalculated matrix

4   transformation look-up table for at least one of said plurality of light sources, when said light

5   source has a fixed perspective of said scene.

9.

1   ~~56.~~ (New)   The method as recited in Claim ~~49~~ **1** wherein at least a portion of said

2   source color data is selectively controlled source color data that can be changed over a period of

3   time during which at least the step of outputting the resulting image data is repeated a plurality of

4   times.

10,

1   ~~57.~~(New)   The method as recited in Claim ~~56~~ **9** wherein said controlled source color

2   data includes data selected from a set comprising motion picture data, video data, animation data,

3   and computer graphics data.

11.

1   ~~58.~~ (New)   An arrangement configured to render shadows in a simulated multi-

2   dimensional scene, the arrangement comprising:

3   an output to a display screen configured to display image data;

4   memory for storing data including observer data associated with a simulated multi-

5   dimensional scene, and lighting data associated with a plurality of simulated light sources

6   arranged to illuminate said scene, said lighting data including light image data, said memory

7   further including a light accumulation buffer portion and a frame buffer portion;

8   at least one processor coupled to said memory and said output and operatively configured

9   to, for each of said plurality of light sources, compare at least a portion of said observer data with

10   at least a portion of said lighting data to determine if a modeled point within said scene is

11   illuminated by said light source and storing at least a portion of said light image data associated

12   with said point and said light source in said light accumulation buffer, then combining at least a

13   portion of said light accumulation buffer with said observer data, and storing resulting image data

14   in said frame buffer, and outputting at least a portion of said image data in said frame buffer via

15   said output.

1   59. (New)   The arrangement as recited in Claim 58, wherein said observer data

2   includes observed color data and observed depth data associated with a plurality of modeled

3   polygons within said scene as rendered from an observer's perspective.

60. (New)   The arrangement as recited in Claim 59, wherein said plurality of modeled

2   polygons within said scene are associated with at least one pixel on said display screen, such that

3   said observed color data includes an observed red-green-blue value for said pixel and said

4   observed depth data includes a observed z-buffer value for said pixel..

14.

1   61. (New)   The arrangement as recited in Claim 59, wherein said lighting data

2   includes source color data associated with at least one of said light sources and source depth data

3   associated with said plurality of modeled polygons within said scene as rendered from a plurality

4   of different light source's perspectives.

15.

1   62. (New)   The arrangement as recited in Claim 61, wherein said plurality of modeled

2   polygons within said scene are associated with at least one pixel, such that said source color data

3   includes a source red-green-blue value for said pixel and said source depth data includes a source

4   z-buffer value for said pixel.

16.

1   63. (New)   The arrangement as recited in Claim 61, wherein said processor is further

2   configured to compare at least a portion of said observed depth data with at least a portion of said

3   source depth data to determine if said modeled point is illuminated by said light source.

17.

1   64. (New)   The arrangement as recited in Claim 63, wherein said processor is further

2   configured to convert at least a portion of said observed depth data from said observer's

3   perspective to at least one of said plurality of different light source's perspectives, before

4   comparing said observed depth data with said source depth data.

18.

1   65. (New)   The arrangement as recited in Claim 64, wherein said memory further

2   includes at least one precalculated matrix transformation table associated with at least one of said

3   plurality of light sources, and said processor is further configured to use said precalculated matrix

4   transformation look-up table when said light source is simulated as having a fixed perspective of

5   said scene.

19.

1   ~~66. (~~New)   The arrangement as recited in Claim *14*, wherein said processor is further

2   configured to selectively control at least a portion of said source color data over a period of time.

20.

1   ~~67.~~(New)   The arrangement as recited in Claim *19*, wherein said controlled source

2   color data includes data selected from a set comprising motion picture data, video data,

3   animation data, and computer graphics data.

21.

1   ~~68.~~(New)   A computer-readable medium carrying at least one set of computer

2   instructions configured to cause a computer to operatively simulate light falling on a modeled

3   object in a computer generated multi-dimensional graphics simulation by performing operations

4   comprising:

5   a)   rendering an observer view of at least a portion of a spatially modeled object as a

6   plurality of observed depth values and observed image values;

7   b)   rendering a source view of at least a portion of said modeled object as a plurality

8   of source depth values and a plurality of source image values;

9   c)   transforming at least a portion of said observed depth values to said source view;

10   d)   modifying at least one image accumulation value with one of said observed image

11   values if said corresponding transformed observer value is equal to a comparable one of said

12   source depth values;

13   e)   multiplying said one of said observed image values by said at least one image

14   accumulation value to produce at least one pixel value; and

15   f)   output said pixel value to a computer screen .

22.

~~69.~~ (New)   The computer-readable medium as recited in Claim ~~68~~, 21 further configured

2   to cause tcomputer to perform the further step of:

3   g)   following step d), repeating steps b) through d) for at least one additional source

4   view.

23.

1   ~~70.~~ (New)   The computer-readable medium as recited in Claim ~~69~~, 22 further configured

2   to cause the computer to perform the further steps of:

3   h)   repeating steps a) through g) a frame rate; and

4   wherein step f) further includes sequentially outputting a plurality of pixels as frames of

5   data to said computer screen at said frame rate, and said step of rendering said source view

6   further includes changing at least one of said source image values between said subsequent

7   frames of data.

24.
21. (New)   The computer-readable medium as recited in Claim 23 wherein at least a

portion of said source image values represent color data selected from a set comprising motion

picture data, video data, animation data, and computer graphics data.

25.
72. (New)   The computer-readable medium as recited in Claim 23, wherein step c)

further includes transforming at least a portion of said observed depth values from an observer

coordinate system to a corresponding source coordinate system.

26.
73. (New)   The computer-readable medium as recited in Claim 25, wherein the step of

transforming at least a portion of said observed depth values from an observer coordinate system

to a corresponding source coordinate system further includes using a precalculated

transformation table to transform directly from said observer coordinate system to said

corresponding source coordinate system.

27.
74. (New)   A computer-readable medium carrying at least one set of computer

instructions configured to cause at least one processor to operatively render simulated shadows in

a multi-dimensional simulated scene by performing the steps of:

providing observer data of a simulated multi-dimensional scene;

providing lighting data associated with a plurality of simulated light sources arranged to

6   illuminate said scene, said lighting data including light image data;

7   for each of said plurality of light sources, comparing at least a portion of said observer

8   data with at least a portion of said lighting data to determine if a modeled point within said scene

9   is illuminated by said light source and storing at least a portion of said light image data

10   associated with said point and said light source in a light accumulation buffer; and then

11   combining at least a portion of said light accumulation buffer with said observer data; and

12   outputting resulting image data to a computer screen.

1   ~~75.~~ (New)   The computer-readable medium as recited in Claim 74, wherein said

2   observer data includes observed color data and observed depth data associated with a plurality of

3   modeled polygons within said scene as rendered from an observer's perspective.

1   ~~76.~~ (New)   The computer-readable medium as recited in Claim 75, wherein said

2   plurality of modeled polygons within said scene are associated with at least one pixel, such that

3   said observed color data includes an observed red-green-blue value for said pixel and said

4   observed depth data includes a observed z-buffer value for said pixel.

1   ~~77.~~ (New)   The computer-readable medium as recited in Claim 75, wherein said

2   lighting data includes source color data associated with at least one of said light sources and

3   source depth data associated with said plurality of modeled polygons within said scene as

4   rendered from a plurality of different light source's perspectives.

31,

1   78. (New)   The computer-readable medium as recited in Claim 78, *28* wherein said

2   plurality of modeled polygons within said scene are associated with at least one pixel on said

3   computer screen, such that said source color data includes a source red-green-blue value for said

4   pixel and said source depth data includes a source z-buffer value for said pixel.

32.

1   79. (New)   The computer-readable medium as recited in Claim 77, *30* wherein the step of

2   comparing at least a portion of said observer data with at least a portion of said lighting data to

3   determine if a modeled point within said scene is illuminated by said light source further includes

4   comparing at least a portion of said observed depth data with at least a portion of said source

5   depth data to determine if said modeled point is illuminated by said light source.

33.

1   80. (New)   The computer-readable medium as recited in Claim 79, *32* wherein the step of

2   comparing at least a portion of said observed depth data with at least a portion of said source

3   depth data to determine if said modeled point is illuminated by said light source further includes

4   converting at least a portion of said observed depth data from said observer's perspective to at

5   least one of said plurality of different light source's perspectives, before comparing said observed

6   depth data with said source depth data.

31. (New)   The computer-readable medium as recited in Claim 80, wherein the step of converting at least a portion of said observed depth data from said observer's perspective to at least one of said plurality of different light source's perspectives further includes using a precalculated matrix transformation look-up table for at least one of said plurality of light sources, when said light source has a fixed perspective of said scene.

82. (New)   The computer-readable medium as recited in Claim 77, wherein at least a portion of said source color data is selectively controlled source color data that can be changed over a period of time during which at least the step of outputting the resulting image data to said computer screen is repeated a plurality of times.

83. (New)   The computer-readable medium as recited in Claim 82, wherein said controlled source color data includes data selected from a set comprising motion picture data, video data, animation data, and computer graphics data.--

CLEAN VERSION OF CLAIMS AFTER PRELIMINARY AMENDMENT

1   1. (Amended) A shadow rendering method, the method comprising the steps of:

2   providing observer data of a simulated multi-dimensional scene;

3   providing lighting data associated with a plurality of simulated light sources arranged

4   to illuminate said scene, said lighting data including light image data;

5   for each of said plurality of light sources, comparing at least a portion of said

6   observer data with at least a portion of said lighting data to determine if a modeled point

7   within said scene is illuminated by said light source and storing at least a portion of said light

8   image data associated with said point and said light source in a light accumulation buffer;

9   and then

10   combining at least a portion of said light accumulation buffer with said observer data;

11   and

12   outputting resulting image data.

1   49. (New)   The method as recited in Claim 1, wherein said observer data includes

2   observed color data and observed depth data associated with a plurality of modeled polygons

3   within said scene as rendered from an observer's perspective.

1   50. (New)   The method as recited in Claim 49, wherein said plurality of modeled

2   polygons within said scene are associated with at least one pixel, such that said observed

3   color data includes an observed red-green-blue value for said pixel and said observed depth

4   data includes an observed z-buffer value for said pixel.

1   51. (New)   The method as recited in Claim 49, wherein said lighting data includes

2   source color data associated with at least one of said light sources and source depth data

3   associated with said plurality of modeled polygons within said scene as rendered from a

4   plurality of different light source's perspectives.

1   52. (New)   The method as recited in Claim 51, wherein said plurality of modeled

2   polygons within said scene are associated with at least one pixel, such that said source color

3   data includes a source red-green-blue value for said pixel and said source depth data includes

4   a source z-buffer value for said pixel.

1   53. (New)   The method as recited in Claim 51, wherein the step of comparing at

2   least a portion of said observer data with at least a portion of said lighting data to determine

3   if a modeled point within said scene is illuminated by said light source further includes

4   comparing at least a portion of said observed depth data with at least a portion of said source

5   depth data to determine if said modeled point is illuminated by said light source.

1   54. (New)   The method as recited in Claim 53, wherein the step of comparing at

2   least a portion of said observed depth data with at least a portion of said source depth data

3   to determine if said modeled point is illuminated by said light source further includes

4   converting at least a portion of said observed depth data from said observer's perspective to

2

5   at least one of said plurality of different light source's perspectives, before comparing said

6   observed depth data with said source depth data.

1   55. (New)   The method as recited in Claim 54, wherein the step of converting at

2   least a portion of said observed depth data from said observer's perspective to at least one of

3   said plurality of different light source's perspectives further includes using a precalculated

4   matrix transformation look-up table for at least one of said plurality of light sources, when

5   said light source has a fixed perspective of said scene.

1   56. (New)   The method as recited in Claim 49, wherein at least a portion of said

2   source color data is selectively controlled source color data that can be changed over a period

3   of time during which at least the step of outputting the resulting image data is repeated a

4   plurality of times.

1   57. (New)   The method as recited in Claim 56, wherein said controlled source

2   color data includes data selected from a set comprising motion picture data, video data,

3   animation data, and computer graphics data.

1   58. (New)   An arrangement configured to render shadows in a simulated multi-

2   dimensional scene, the arrangement comprising:

3   an output to a display screen configured to display image data;

3

4   memory for storing data including observer data associated with a simulated multi-

5   dimensional scene, and lighting data associated with a plurality of simulated light sources

6   arranged to illuminate said scene, said lighting data including light image data, said memory

7   further including a light accumulation buffer portion and a frame buffer portion;

8   at least one processor coupled to said memory and said output and operatively

9   configured to, for each of said plurality of light sources, compare at least a portion of said

10   observer data with at least a portion of said lighting data to determine if a modeled point

11   within said scene is illuminated by said light source and storing at least a portion of said light

12   image data associated with said point and said light source in said light accumulation buffer,

13   then combining at least a portion of said light accumulation buffer with said observer data,

14   and storing resulting image data in said frame buffer, and outputting at least a portion of said

15   image data in said frame buffer via said output.

1   59. (New)   The arrangement as recited in Claim 58, wherein said observer data

2   includes observed color data and observed depth data associated with a plurality of modeled

3   polygons within said scene as rendered from an observer's perspective.

1   60. (New)   The arrangement as recited in Claim 59, wherein said plurality of

2   modeled polygons within said scene are associated with at least one pixel on said display

3   screen, such that said observed color data includes an observed red-green-blue value for said

4   pixel and said observed depth data includes a observed z-buffer value for said pixel..

4

1   61. (New)   The arrangement as recited in Claim 59, wherein said lighting data

2   includes source color data associated with at least one of said light sources and source depth

3   data associated with said plurality of modeled polygons within said scene as rendered from

4   a plurality of different light source's perspectives.

1   62. (New)   The arrangement as recited in Claim 61, wherein said plurality of

2   modeled polygons within said scene are associated with at least one pixel, such that said

3   source color data includes a source red-green-blue value for said pixel and said source depth

4   data includes a source z-buffer value for said pixel.

1   63. (New)   The arrangement as recited in Claim 61, wherein said processor is

2   further configured to compare at least a portion of said observed depth data with at least a

3   portion of said source depth data to determine if said modeled point is illuminated by said

4   light source.

1   64. (New)   The arrangement as recited in Claim 63, wherein said processor is

2   further configured to convert at least a portion of said observed depth data from said

3   observer's perspective to at least one of said plurality of different light source's perspectives,

4   before comparing said observed depth data with said source depth data.

5

1   65. (New)   The arrangement as recited in Claim 64, wherein said memory further

2   includes at least one precalculated matrix transformation table associated with at least one

3   of said plurality of light sources, and said processor is further configured to use said

4   precalculated matrix transformation look-up table when said light source is simulated as

5   having a fixed perspective of said scene.

1   66. (New)   The arrangement as recited in Claim 61, wherein said processor is

2   further configured to selectively control at least a portion of said source color data over a

3   period of time.

1   67. (New)   The arrangement as recited in Claim 66, wherein said controlled

2   source color data includes data selected from a set comprising motion picture data, video

3   data, animation data, and computer graphics data.

1   68. (New)   A computer-readable medium carrying at least one set of computer

2   instructions configured to cause a computer to operatively simulate light falling on a modeled

3   object in a computer generated multi-dimensional graphics simulation by performing

4   operations comprising:

5   a)   rendering an observer view of at least a portion of a spatially modeled object

6   as a plurality of observed depth values and observed image values;

6

7   b)   rendering a source view of at least a portion of said modeled object as a

8   plurality of source depth values and a plurality of source image values;

9   c)   transforming at least a portion of said observed depth values to said source

10   view;

11   d)   modifying at least one image accumulation value with one of said observed

12   image values if said corresponding transformed observer value is equal to a comparable one

13   of said source depth values;

14   e)   multiplying said one of said observed image values by said at least one image

15   accumulation value to produce at least one pixel value; and

16   f)   output said pixel value to a computer screen .

1   69. (New)   The computer-readable medium as recited in Claim 68, further

2   configured to cause tcomputer to perform the further step of:

3   g)   following step d), repeating steps b) through d) for at least one additional

4   source view.

1   70. (New)   The computer-readable medium as recited in Claim 69, further

2   configured to cause the computer to perform the further steps of:

3   h)   repeating steps a) through g) a frame rate; and

4   wherein step f) further includes sequentially outputting a plurality of pixels as frames

5   of data to said computer screen at said frame rate, and said step of rendering said source view

7

6　further includes changing at least one of said source image values between said subsequent

7　frames of data.

1　　　71. (New)　　The computer-readable medium as recited in Claim 70 wherein at least

2　a portion of said source image values represent color data selected from a set comprising

3　motion picture data, video data, animation data, and computer graphics data.

1　　　72. (New)　　The computer-readable medium as recited in Claim 70, wherein step

2　c) further includes transforming at least a portion of said observed depth values from an

3　observer coordinate system to a corresponding source coordinate system.

1　　　73. (New)　　The computer-readable medium as recited in Claim 72, wherein the

2　step of transforming at least a portion of said observed depth values from an observer

3　coordinate system to a corresponding source coordinate system further includes using a

4　precalculated transformation table to transform directly from said observer coordinate system

5　to said corresponding source coordinate system.

1　　　74. (New)　　A computer-readable medium carrying at least one set of computer

2　instructions configured to cause at least one processor to operatively render simulated

3　shadows in a multi-dimensional simulated scene by performing the steps of:

4　　　　providing observer data of a simulated multi-dimensional scene;

8

5   providing lighting data associated with a plurality of simulated light sources arranged

6   to illuminate said scene, said lighting data including light image data;

7   for each of said plurality of light sources, comparing at least a portion of said

8   observer data with at least a portion of said lighting data to determine if a modeled point

9   within said scene is illuminated by said light source and storing at least a portion of said light

10   image data associated with said point and said light source in a light accumulation buffer;

11   and then

12   combining at least a portion of said light accumulation buffer with said observer data;

13   and

14   outputting resulting image data to a computer screen.

1   75. (New)   The computer-readable medium as recited in Claim 74, wherein said

2   observer data includes observed color data and observed depth data associated with a

3   plurality of modeled polygons within said scene as rendered from an observer's perspective.

1   76. (New)   The computer-readable medium as recited in Claim 75, wherein said

2   plurality of modeled polygons within said scene are associated with at least one pixel, such

3   that said observed color data includes an observed red-green-blue value for said pixel and

4   said observed depth data includes a observed z-buffer value for said pixel.

1   77. (New)   The computer-readable medium as recited in Claim 75, wherein said

2   lighting data includes source color data associated with at least one of said light sources and

3   source depth data associated with said plurality of modeled polygons within said scene as

4   rendered from a plurality of different light source's perspectives.

1   78. (New)   The computer-readable medium as recited in Claim 75, wherein said

2   plurality of modeled polygons within said scene are associated with at least one pixel on said

3   computer screen, such that said source color data includes a source red-green-blue value for

4   said pixel and said source depth data includes a source z-buffer value for said pixel.

1   79. (New)   The computer-readable medium as recited in Claim 77, wherein the

2   step of comparing at least a portion of said observer data with at least a portion of said

3   lighting data to determine if a modeled point within said scene is illuminated by said light

4   source further includes comparing at least a portion of said observed depth data with at least

5   a portion of said source depth data to determine if said modeled point is illuminated by said

6   light source.

1   80. (New)   The computer-readable medium as recited in Claim 79, wherein the

2   step of comparing at least a portion of said observed depth data with at least a portion of said

3   source depth data to determine if said modeled point is illuminated by said light source

4   further includes converting at least a portion of said observed depth data from said observer's

5   perspective to at least one of said plurality of different light source's perspectives, before

6   comparing said observed depth data with said source depth data.

1   81. (New)   The computer-readable medium as recited in Claim 80, wherein the

2   step of converting at least a portion of said observed depth data from said observer's

3   perspective to at least one of said plurality of different light source's perspectives further

4   includes using a precalculated matrix transformation look-up table for at least one of said

5   plurality of light sources, when said light source has a fixed perspective of said scene.

1   82. (New)   The computer-readable medium as recited in Claim 77, wherein at

2   least a portion of said source color data is selectively controlled source color data that can

3   be changed over a period of time during which at least the step of outputting the resulting

4   image data to said computer screen is repeated a plurality of times.

1   83. (New)   The computer-readable medium as recited in Claim 82, wherein said

2   controlled source color data includes data selected from a set comprising motion picture data,

3   video data, animation data, and computer graphics data.